Ra'anan Weiss

F-16I Sufa
in IAF service

Aircraft in Details 1

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OVE BEFORE FLIGH

Lockheed Martin

F-16I Sufa

in IAF Service

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Text: Yoav Efrati & Ron Feldman

As close as it gets. The author in the cockpit of a Bat Squadron F-16I.

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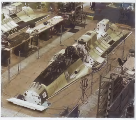
INTRODUCTION

To enable aircraft to fly faster and carry ever increasing payload, designers and manufacturers have been using aluminum alloys as structures of their aircraft since the early 1930's. Pound for pound, aluminum is stronger, lighter, cheaper and more ductile than any other material used for manufacturing aircraft. Like any other metal, aluminum does not retain these qualities indefinitely. As metal ages with time and use, it looses its resilience and is prone to cracking due to phenomena known as metal fatigue. In addition to erosion of elements (corrosion), phase-out of aircraft in favor of new designs of the manufacturer and other technical advances in metallurgy, avionics and alike make even the best fighter in the world obsolete. As mid-1970's productions A-4N Skyhawk and F-4E Phantom II airframes reached their 30 year operational service, the IAF sought worthy aircraft to replace them.

In 1994 Boeing's F-15E Strike Eagle was chosen over Lockheed Martin's F-16 to replace the Hammer squadron's F-4E Phantoms. At the time, Lockheed Martin's proposal to add upper fuselage conformal fuel tanks (CFT) was only a paper study that was considered an unproven strategic gamble for the IAF. As F-15I delivery got underway, Boeing and Lockheed Martin were again clashing against each other for another round of fighter replacements. By that time Lockheed Martin's CFT trials had proved viable, and the company was able to prove that the addition of CFT's to the F-16 can grant it a maximum range of 1,480 kilometers that was only 40 kilometers short of the F-15I's maximum range. With significant cost reduction in operating a single engine fighter versus the F-15I's two powerplants, spare parts, support equipment commonality with other F-16's in IAF inventory and at only 60% the price of the F-15I – there was no contest. On July 19th, 1999, the Israeli government headed by Prime Minister Ehud Barak announced the decision to purchase fifty block 52 F-16's in a contract worth $2.5 billion. The deal was sweetened by an offset local manufacture agreement in which 25% of the F-16I purchase cost will be spent in Israel.

For the next fourteen months the F-16I program was to take shape in the form of the Peace Marble V program that was agreed upon by the governments of Israel and the United States on September 5, 2001. The program involved the purchase of 50 aircraft, with an option to order another batch of 52 aircraft at a reduced total value of $2 billion, with all aircraft to be delivered between 2003 and 2008. All purchased aircraft were to be two seat F-16D airframes fitted with Pratt & Whitney 29,000 pound thrust F100-PW-229 powerplant that also equips the F-15I. The radar chosen for the F-16I was Northrop Grumman's APG-68 (V9), an improved version of the APG-68 (V7/8) radar that is currently operational with IAF block 30 and block 40 F-16C/D aircraft. The F-16I is equipped with a strengthened landing gear, capable of loads of up to 23.6 tons, the highest load capability of any F-16 variant delivered to date. Northrop Grumman's APG-68(V9) offers 30% increase in detection range, reduced false alarms, mutual interference between radars and can track four targets simultaneously in comparison to only two in its earlier models. In the air to ground mode, it has a two feet resolution using a new synthetic aperture radar mapping mode. This feature is useful for the delivery of GPS guided munitions such as JDAM and allows an accurate bomb delivery at night, through clouds or fog conditions. The radar utilizes commercial off the shelf technology in hardware design that increases the radar's processing speed five fold and its memory capacity 10 fold



Above: The first F-16I Sufa aircraft on the production line of Lockheed Martin Aeronautics at Fort Worth, Texas.

Left: F-16I number 00-1001, tail number 253 at the roll-out ceremony, November 14, 2003. This was the 4th aircraft produced and subsequently took off to its maiden flight on December 23rd. The actual tail number is 401. The aircraft is due to enter service in the summer of 2006 with Manat - IAF Test & Evaluation unit.

Above: Aircraft number 00-1022, tail number 444 landing at Fort Worth after one of its test flights. This F-16I is currently operational with the IAF Negev squadron.
Photo: Keith Robinson

over the previous generation of the AGP-68. Use of the same components also provides a 50% increase in radar reliability with a mean time between failure-rate (MTBF) of 400 hours. A new inertial measurement unit fitted to the radar antenna improves its pointing accuracy and eliminates time consuming bore-sighting maintenance. Other benefits of using the APG-68(V9) radar as opposed to the new AN/APG-80 "Agile Beam Radar" with Active Electronically Scanned Array, fitted to the new generation of F-16E and F.

F-16 fighters recently purchased by the United Arab Emirates have its commonality with the previous generation of APG-68(V7/8) radar, thus the support equipment, training, logistical base and knowledge gained in operating the (V7/8) can be put to use in operating the (V9). A new operational capability to IAF F-16's is the ability to launch beyond visual range (BVR) AIM-120 AMRAAM air-to-air missiles. The AIM-120 acquires its targets from the aircraft's radar and once launched it no longer requires additional radar information as it continues tracking its target with its own radar. To prevent interception of friendly aircraft, the F-16I incorporates four blade antennas fitted just forward of the canopy that interrogate BVR targets to determine if they are friend or foe (IFF).

Another off-the-shelf system purchased is Lockheed Martin's AN/AAQ-13 LANTIRN navigation pod. The pod, positioned on the left side of the intake, enables low altitude nap of the

The Sufa patch. It is positioned on F-16I aircrew flight-suit right arm.

Right: Aircraft number 00-1020, tail number 440, approaching landing after a test flight. The payload consists of two 370 gallon underwing and a 300 gallon centerline external fuel tanks.
Photo: Keith Robinson

Left: Aircraft number 00-1005, tail number 407, one of the first two F-16I delivered to the IAF, during the transfer flight to Israel, February 17th, 2004.

Left: The second F-16I of the first pair delivered was aircraft number 00-1006, tail number 408, during air refueling from a USAF KC-135 on-route to Israel. Noteworthy is the USAF Marking applied only to the right wing, while the IAF markings are covered.

Below: F-16I number 407 over the Negev Desert nearing Ramon AFB at low altitude after the long ferry flight from the USA. The aircraft is escorted by two Defenders of the South squadron F-16A Netz.

***Right:** Prior to first landing in Israel, a low pass of the first two F-16I fighters over the awaiting crowd.*

***Below:** Sufa numbers 407 and 408 taxiing towards the welcoming ceremony. The aircraft arrived without their unique CFT's.*

earth flight at night and in adverse weather conditions without pilot joystick input. New cockpit improvements introduced into the F-16I's cockpit include full color multi function displays, moving map displays, digital video recording and lighting compatible with night vision goggles.

The basic features offered by Lockheed Martin makes Israel's newest F-16 variant a block 52 F-16D, what sets it apart from other F-16's operational world-wide is its local content which set the F-16I designation. Local manufactures include Israel Aircraft Industries, Israel Military Industries, Elbit Systems, El-Op, Cyclone, BVR, RADA, RAFAEL, Astronautics and RSL.

Elbit Systems supplies the F-16I's forth generation Dash IV helmet visor display that enables both the pilot and weapon-system operator (WSO) to slave sensors and missile seeker heads to their line of sight and also enables them acquire targets at high angles to their line of flight. The helmet display also provides the pilot and WSO crew critical threat warning information in all directions, improving their situation awareness. The Elbit's Dash IV helmet has been chosen to equip the US latest generation of F-18E/F, F-22 and F-35 fighters. Other Elbit systems fitted to the F-16I include a mission computer and digital processor that feed all sensor information to the aircraft's full color Astronautics multi function displays. El-Op, a subsidiary of Elbit Systems, will supply later versions of the Sufa with a wide HUD originally designed for the Lavi fighter that will replace current British Aerospace head up displays.

RAFAEL armament development authority supplies the F-16I's secure communications

transmitters and receivers operating in the HF, VHF and UHF bands. RAFAEL also contributes the logarithms for the aircraft navigation suite which integrates Lockheed Martin's pod, Elta's satellite communications antenna and laser gyro inertial navigation instruments. RAFAEL Lightning II pod is installed to the right side of the intake and provides the pilot and WSO day and night optically magnified picture of the ground. The pod can both designate and view laser beams, enabling the delivery of laser guided bombs and missiles from any aircraft operating with the F-16I, including the new AH-64D Saraf.

Another RAFAEL system is the Sufa's aerial offensive punch, the aircraft's Python 4 and the upgraded Python 5 air-to-air missiles. The Python 4's capabilities were reported in October 1996 by Flight magazine. Its dimensions are similar to the Python 3 being 160mm in diameter and weighing 105Kg. Unlike the Russian R-73 and US AIM-9X of the same missile generation, the Python 4 incorporates aerodynamic controls to achieve its high angle of attack. The Python 4 has a 60 degrees off bore sight capability (looking sideways) in comparison to only 15 degrees of the Python 3. The missile's forward fin pairs are of a unique design. The front fins are fixed canards while the adjacent fin set to the aft provide pitch and yaw control. Further aft are two small blade fins that act as ailerons for roll stabilization. In the rear section there are four roll stabilization fins while the long streaks ahead of the aft fins are used for strengthening the missiles motor section during high-g maneuvering. The Python 4 is reported as capable of withstanding a 70g instantaneous maneuvering load which is twice that reported of the AIM-9X. In conjunction with Elbit's helmet mounted sight, the pilot can lock on to any target he sees within 5.5 kilometers (3 nautical miles) from the aircraft, even a target flying behind him!

Complementing the Python IV is the RAFAEL Spice optically guided glide bomb kits that are fitted to standard Mk.83 – 1,000 lbs and Mk.84 – 2,000 lbs bombs. The Spice uses state-of-the-art navigation, guidance and homing technologies to achieve accurate and effective destruction of high-value enemy targets. Spice's Automatic Target Acquisition

Above: F-16I number 407 approaching the final destination. Noteworthy is the baggage pod on station 3, most likely the MXU-648, which consists of the air-crew personnel gear and the aircraft safety pins.

Below: Aircrew of the leading aircraft exits the cockpit. The two aircraft consisted mixed USAF and IAF pilots. Lieut. Roee is seen in this photo.

Photos in this page: A day after the arrival of numbers 407 and 408, the first flight in Israeli skies took place. Aircraft number 408 was piloted by Lieut.-Col. Amikam and Major Yuval.

Above and bottom: Aircraft number 407 experienced minor technical problems and took-off later that day. The aircraft was manned by the Wing Commander Col. Nimrod and Cap. Tal. Photos in this page depict the aircraft taxiing towards the runway.

The Negev squadron patch.

capability employs unique scene-matching technology that can take into account changes in landscape. The use of GPS, optical guidance and its internal memory bank of up to 100 targets makes the Spice immune to counter-measures, navigational and target location errors. The technology compares a real-time image received from the dual CCD/IIR seeker to a reference image stored in the weapon's computer. The Spice has demonstrated a glide range of 60 kilometers and a circular error probability of less than 3 meters.

Israel Military Industries (IMI) contribution to the F-16I program, as well as to other variants of the F-16, does not end with external fuel tanks and stores pylons. IMI manufactures the F-16I's long range "spear", the Delilah. It is considered as a cruise missile and is powered by an air breathing turbo jet engine that enables the 187Kg air to ground missile to fly at a cruise speed of Mach 0.3-0.7, at heights ranging from sea level to 28,000 feet, to a maximum range of 250 kilometers. The advantage of the Delilah over other pre-guided cruise missiles is its electro optical system that enables the Sufa's WSO to view the missiles flight path and if needed divert it from its preprogrammed course. This in-flight flexibility enables the Delilah to hit targets of opportunity or to divert it from a pre-programmed target if collateral damage may be evident. Another advantage the Delilah has over other air to ground missiles is its day/night, all weather dual electro optical/infrared seeker head which enables the crew launching the Delilah to destroy moving targets or targets that have changed their location, for example Scud surface-to-surface missiles and mobile SAM's.

The F-16I's on board RADA produced data link relays a wide range of information to ground stations. This information includes on board system failures for ease of maintenance and troubleshooting. Digital imagery from the aircraft's optical sensors such as the HUD and the Lightning pod for real time mission evaluation and post mission debrief.

The Elisra self protection system is the most advanced in the world. It consists of Radar Warning Receivers (RWR) to detect incoming enemy radar signals. When radar guided or infrared homing missiles are launched at the Sufa, the aircraft's ten on board BAE Rokar chaff/flare dispensers eject flares or chaff to provide a false target for the incoming missiles.

On September 6, 2001 Lockheed Martin completed the first phase of flight testing of its new conformal fuel tanks for the F-16. Twenty-Four flights and 65 flight hours were conducted with dry fuel tanks. The tests took place from March through August 2001 at Edwards Air Force Base, California, confirmed the CFT design's ability to withstand operating loads, without fluttering and without adversely affecting the F-16's stability and control during flight. Wet fuel tank tests were performed on an F-16C of the 40th Flight Test squadron at

Above: Lieut.-Col. Amikam and Major Yuval prepare to descend from the cockpit after the maiden flight of an F-16I in Israel.

Below: Lieut.-Col. Amikam and Major Yuval being interviewed after their first flight. Noteworthy are the lowered visors to prevent identification and the Negev squadron patch.

Eglin Air Force Base, Florida. Between January 2001 and October 2002, 54 test flights and 135 flight hours validated the fuel system interface with the CFT's under various flight profiles proven in the dry fuel tank tests at Edwards Major Timothy S. McDonald, USAF project pilot for CFT testing said "The CFT's have very little adverse affect on the F-16's renowned performance. The aircraft retains its full 9g capability and flight envelope with the CFT's installed. The drag impact is very small, less than one percent in combat configuration and cruise conditions". A set of CFT's carry 50 percent more fuel than the standard 300 gallon centerline fuel tank carried by the F-16 with only 12 percent of the drag. Two CFT's provide a total of 450 gallons of fuel that translate to 3,050 pounds of fuel. CFT's installed along the upper fuselage can be installed or removed within two hours. They provide added range while freeing the most needed high load inboard wing pylon locations. Although initially designed to meet the IAF's strategic reach requirement, production conformal fuel tanks were first to see flight on March 19, 2003 fitted to Hellenic Air Force block 52 F-16C/D aircraft. Israel's long range capability will be made possible by Israel Military Industries that manufacture the F-16's 300 gallon centerline, 370 and 600 gallon external wing fuel tanks and by Israel Aircraft Industries that will produce the F-16I's conformal fuel tanks.

Long range flight is not related only to the amount of fuel the aircraft can carry, it is also influenced by the amount of oxygen available to the pilot. For the fighter to reach maximum range, it is flown at high altitude where the air is thin and fuel consuming drag is at it lowest density. At high altitude the amount of oxygen required for breathing is insufficient. The F-16I is equipped with its own oxygen generator that provides the crew an unlimited supply of oxygen for any duration of flight. Previous generation of fighters, such as the F-4 Phantom used oxygen bottles that were limited in capacity and once depleted limited flight altitude to below 10,000 feet. The on board oxygen system also eliminates dangerous handling of extremely flammable oxygen on the ground, and frees the aircraft to operate from austere runways, free of the need for oxygen refills. The aircraft's air conditioning

***Left and Below:** Negev squadron Sufa number 408 in formation with 'The One' squadron F-4E Kurnass 2000 number 634. 'The One' will become the forth F-16I squadron toward the end of 2007.*

***Bottom:** Sufa number 408 in one of the first sorties over the Mediterranean Sea.*

system is the envy of every pilot, able to cool both the cockpit and all onboard avionics even at +40 Degrees Celsius temperatures encountered in desert environment of the Middle East, courtesy of the powerful PW F-100 powerplant.

To make the F-16I less conspicuous over the terrain of the Middle East, and to distinguish it from other F-16's operated world-wide, the Sufa retains the F-16's original 1980 vintage colors of FS30219 Brown, FS33531 Sand, FS 34424 Green with FS36375 Light Ghost Grey lower fuselage. Common to other production models of the F-16 world-wide, the radome, missile rails, antenna and sensor covers are all FS36270 Neutral Grey. Since the CFT's are manufactured in Israel, local Tambur paints are used as their camouflage colors, with the Tambur FS30219 Brown being slightly more

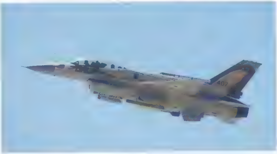
The official re-opening event of The Bat squadron as the second IAF F-16I squadron, took place on December 28th, 2004. Noteworthy in the top photo are the bat motif and familiar red flash and also the right CFT. IAF Commander, Maj.-Gen. Elyezer Shkedy is shown above in the welcome speech and applying the squadron badge to Sufa number 119, together with the squadron Commander Lieut.-Col. David.

The Bat squadron patch

reddish in comparison to its US equivalent. The forward sections of the CFT's are painted gloss FS14424 Green for aerodynamic smoothness.

The first production F-16I was presented to the IAF on November 14, 2003 in a roll-out ceremony held at the Lockheed Martin Aeronautics plant at Fort Worth, Texas. Attending the ceremony were Israeli Defense Minister Shaul Mofaz and IAF Commander, Major General Elyezer Shkedy. The aircraft, s/n 00-1001 was marked with tail number 253 and displayed in a long range strike configuration carrying upper fuselage CFT's, 600 gallon fuel tanks, a centerline 300 gallon fuel tank, a pair of wingtip mounted AIM-120 radar guided missiles, a pair of Python 4 infrared homing missiles and a pair of JDAM GPS guided bombs under the wings. During the acceptance ceremony, the F-16I was officially awarded the name of Sufa, which means storm in Hebrew. On December 23, 2003, the F-16I Sufa first took to the air in a 55 minute maiden flight in aircraft s/n 00-1004 that was also given the tail number 253. This flight was conducted to assess the aircraft flight controls, landing gear, environmental controls (air conditioning) cockpit and basic avionics systems.

The first two Sufa aircraft arrived in Israel on February 19, 2004, directly from Lockheed Martin's Texas plant to the Ramon AFB in the Negev Desert. These two aircraft were identified with tail numbers 407 s/n 00-1005 and 408 s/n 00-1006. During the acceptance ceremony, the two aircraft were adorned with the Negev squadron's fin insignia. The Negev squadron was one of the first three squadrons to be equipped with the F-16A/B Netz alongside the First Jet and Knights of the North squadrons, between 1980 and 1982. While the first two Netz operational squadrons moved on to operate block 30 F-16C's, the Negev squadron continued operating the F-16A/B until March 31, 2003. On that day, 36 Netz fighters of the Negev squadron took off in nine formations of four to land minutes later at the Nevatim AFB, home of the Defenders of the South squadron (previously known as the Flying Wing squadron). The second IAF squadron chosen to operate the Sufa was the Bat squadron that operated various versions of the F-4 Phantom II, including the Kurnass 2000, from 1970



Photos in this page: The former IAF commander Maj.-Gen Dan Halutz visited the Negev squadron on March 22nd, 2004, and conducted an air-to-air training sortie with Sufa number 407, against the Phoenix squadron F-16A Netz.
On June 1st, 2005 Dan Halutz was appointed Israel Defense Force chief of the General Staff with a rank of Lieutenant-Genaral.

until the spring of 2003. The Bat squadron reopened as the IAF's second Sufa squadron on December 28, 2004, also at Ramon AFB. With the delivery of the 102nd Sufa, planned for the end of 2008, the IAF will become the second largest operator of the F-16, with 362 aircraft delivered, second to the USAF.

Above and Below: Negev squadron F-16I number 00-1015, tail number 427, in a ground exhibition at Ramon AFB on April 10th, 2005. The reception ceremony for the AH-64D Apache Longbow.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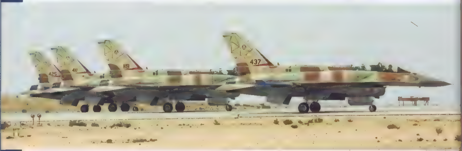
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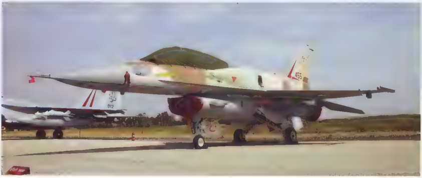
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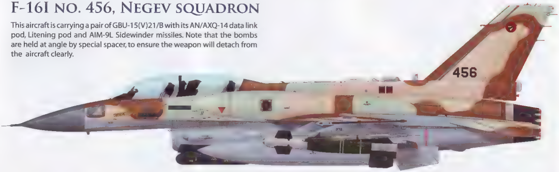
GALLERY

F-16I no. 408, Negev squadron

This aircraft is configured to an air-to-air sortie, with a 300 gallon fuel tank, Python 4 and AIM-9L Sidewinder missiles.

F-16I no. 456, Negev squadron

This aircraft is carrying a pair of GBU-15(V)21/B with its AN/AXQ-14 data link pod, Litening pod and AIM-9L Sidewinder missiles. Note that the bombs are held at angle by special spacer, to ensure the weapon will detach from the aircraft clearly.



F-16I NO. 119, BAT SQUADRON

This aircraft is carrying a pair of GBU-16 LGBs, Litening pod, a pair of 600 gallon fuel tanks, a 300 gallon center line fuel tank and four AIM-9L Sidewinder missiles.

F-16I NO. 451, BAT SQUADRON

This aircraft is carrying a pair of IMI Delilah air-to-surface missiles, Litening pod, AN/AAQ-13 LANTIRN navigation pod, Data link pod, a pair of 600 gallon fuel tanks and a pair of AIM-9L Sidewinder missiles.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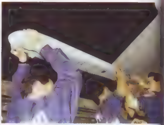

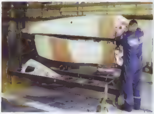

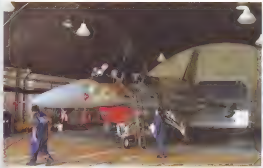


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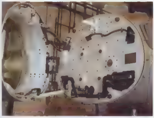


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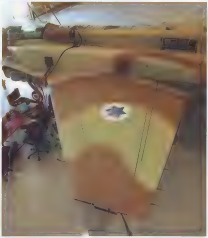


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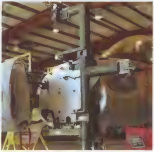

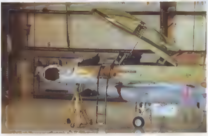



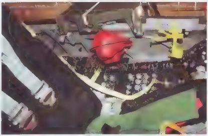



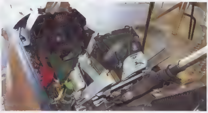

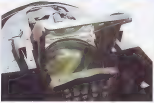


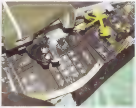

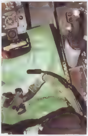


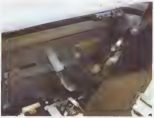






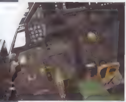
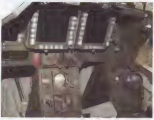


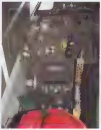

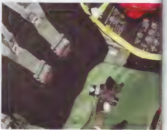




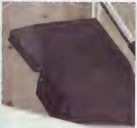



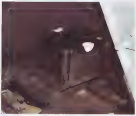





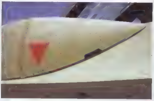
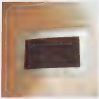

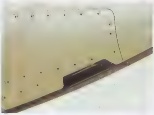
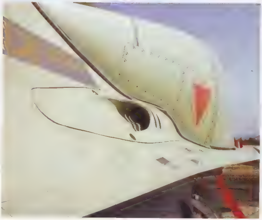
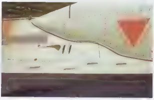


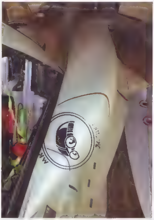

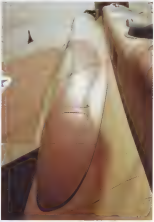

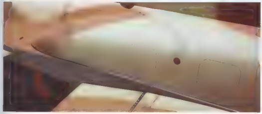

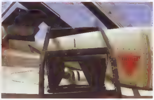

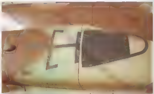

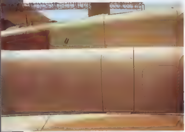

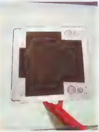

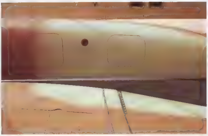

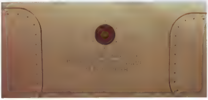

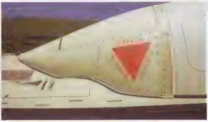

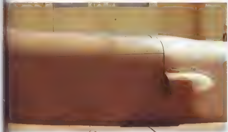

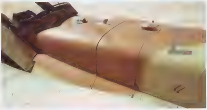


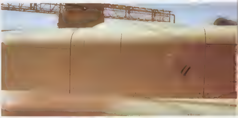




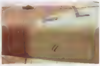
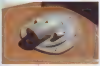



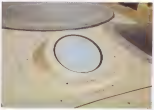
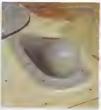
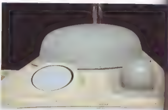
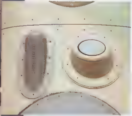

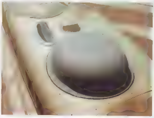



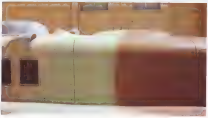
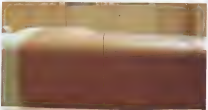

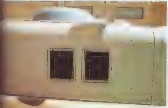

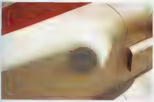

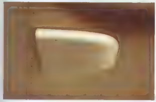


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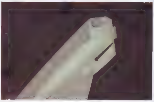


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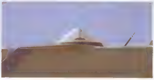


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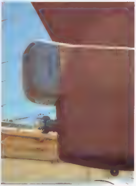

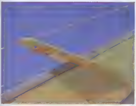


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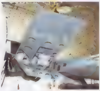
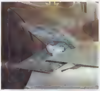
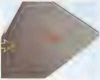
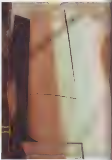


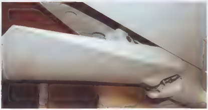




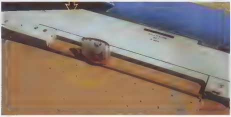





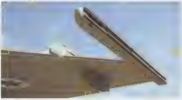

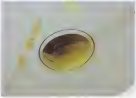

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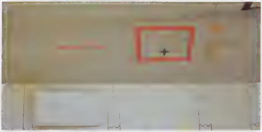
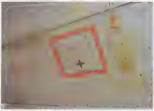
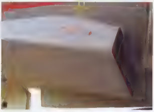
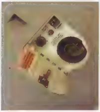
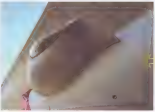
RESCUE

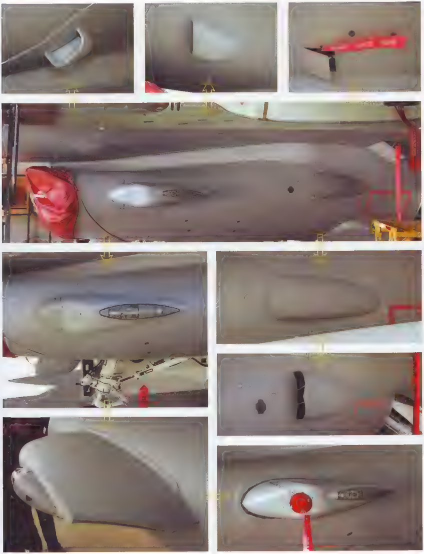


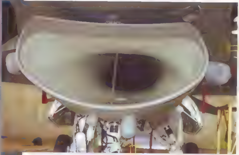


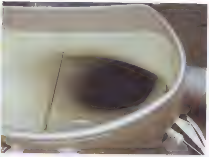


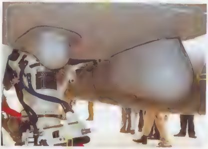


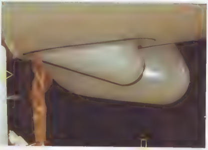










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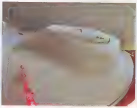

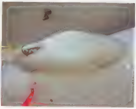

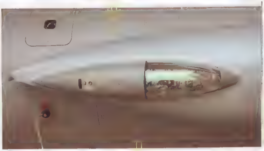

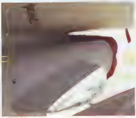

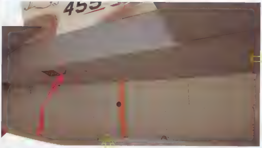
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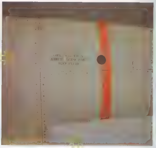


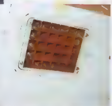

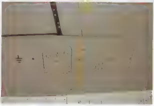







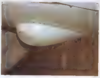






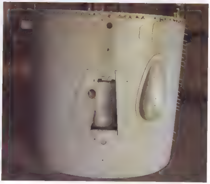



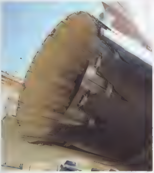


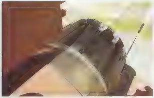



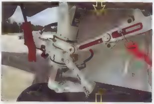

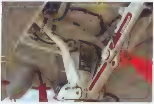



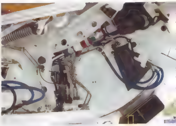



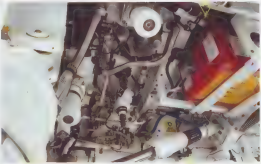

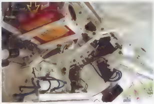
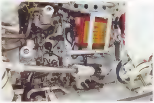
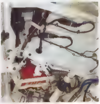

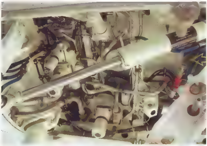





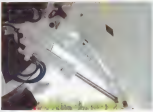








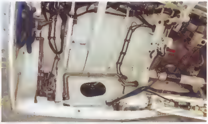


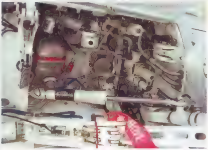


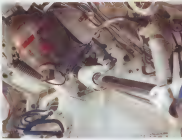

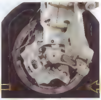

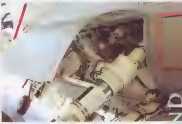


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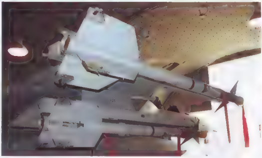


REMOVE


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CLOSE
OPEN


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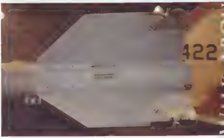
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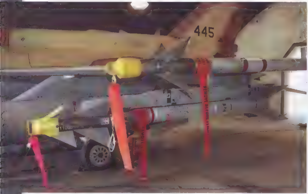
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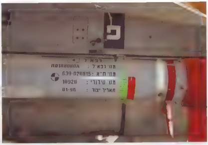


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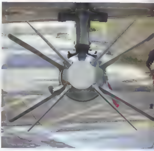

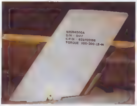

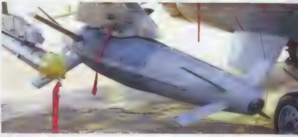

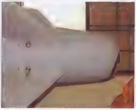

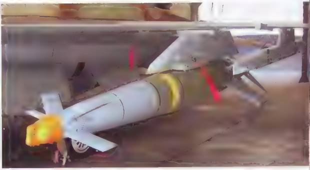

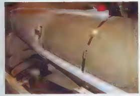

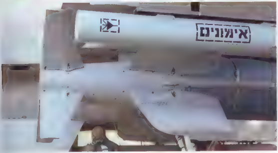
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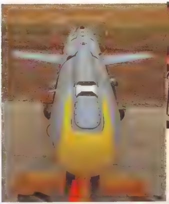


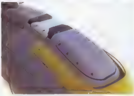

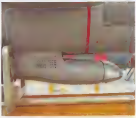




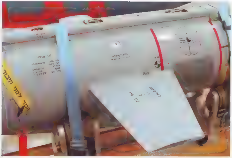


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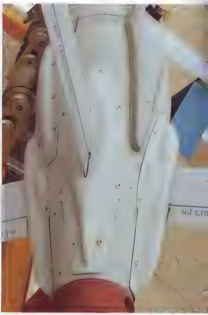

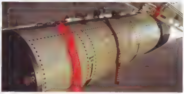

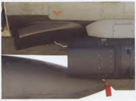


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Photo: Shlomo Aloni

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